

## WE CLAIM:

1. A method for serial data transmission between a position measuring system and a processing unit, comprising  
transmitting a digital data word of defined length between said  
5 processing unit and said position measuring system;  
having a position data request signal arrive during said transmitting of said digital data word;  
determining a position signal regarding a relative chronological position of said position data request signal with respect to said transmitted digital data word;  
10 and  
transmitting said determined position signal to said position measuring system.

2. The method in accordance with claim 1, further comprising determining  
15 as said position signal a time difference between a start of said transmission of said digital data word and said arrival of said position data request signal.

3. The method in accordance with claim 1, further comprising assuring,  
20 with the aid of said transmitted position signal, that actual position data are determined after a defined total time following said arrival of said position data request signal.

4. The method in accordance with claim 3, further comprising storing said  
determined actual position data in said position measuring system.

5. The method in accordance with claim 2, further comprising transmitting  
25 a position data request command in the form of a digital data word to said position measuring system following said transmission of said digital data word.

6. The method in accordance with claim 3, further comprising transmitting  
30 a position data request command in the form of a digital data word to said position measuring system following said transmission of said digital data word.

7. The method in accordance with claim 5, further comprising transmitting said determined time difference as a digital data word to said position measuring system following the transmission of said position data request command.

8. The method in accordance with claim 7, wherein a predetermined total time between said arrival of said position data request signal and a determination of an actual position data is composed at least in part of the summation of:

a remaining transmission time of said transmitted digital data word,  
a required transmission time for transmitting said position data request command and said transmission of said time difference,  
a required processing time for evaluating said position data request command and said transmitted time difference, and  
said transmitted time difference.

9. The method in accordance with claim 2, wherein said time difference is determined with the aid of a counter.

10. The method in accordance with claim 9, further comprising setting said counter back to a defined starting counter value at a start of said transmission of said digital data word.

11. The method in accordance with claim 8, further comprising compensating for a required transmission time of a second position measuring system for transmitting a second position data request command and a transmission of a time difference to said processing unit, wherein said required transmission time of said second position measuring system differs from said required transmission time of said position measuring system.

12. The method in accordance with claim 11, wherein said difference

between said required transmission times of said position measuring system and said second position measuring system is caused by transmission distances of different length in said position measuring system and said second position measuring system.

5           13.     The method in accordance with claim 11, wherein said compensating comprises assigning a common predetermined transmission time for said position measuring system and said second position measuring system, so that a common predetermined total time results for said position measuring system and said second position measuring system.

10           14.     The method in accordance with claim 12, wherein said compensating comprises assigning a common predetermined transmission time for said position measuring system and said second position measuring system, so that a common  
15           predetermined total time results for said position measuring system and said second position measuring system.

20           15.     The method in accordance with claim 14, wherein said common predetermined transmission time corresponds to a maximum transmission time associated with a longest transmission distance between said position measuring system and said second position measuring system.

25           16.     The method in accordance with claim 3, wherein a second position data request signal is generated that has a total time and a lower processing priority than said position data request signal, said method further comprises assigning values of said total times of said position data request signal and said second position data request signal that are dependent on said processing priorities of said position data request signal and said second position data request signal.

30           17.     The method in accordance with claim 16, wherein said assigning comprises assigning a lower value of said total times to said position measuring system

based on said position data request signal having a higher processing priority than said second position data request.

5           18.    A device for serial data transmission comprising:  
              a processing unit;  
              a position measuring system, wherein a transmission of a digital data  
word takes place between said processing unit and said position measuring system,  
              wherein said processing unit comprises a time determination unit which,  
10           in case of a position data request signal arriving during said transmission of said digital  
data word, determines a position signal regarding a relative chronological position of  
said position data request signal with regard to said transmitted data word, and  
              wherein said position measuring system comprises a control unit, which  
processes a position signal transmitted by said processing unit in such a way that, after  
15           a constant total time following the arrival of said position data request signal, a  
determination of an actual position data takes place in said position measuring system.

20           19.    The device in accordance with claim 18, wherein a time difference  
between a start of said transmission of said digital data word and said arrival of said  
position data request signal is used as said position signal.

            20.    The device in accordance with claim 19, wherein said time determination  
unit of said processing unit comprises a counter.

25           21.    The device in accordance with claim 19, wherein a second time  
determination unit for determining a constant total time is arranged in said position  
measuring system.

30           22.    The device in accordance with claim 21, wherein said second time  
determination unit of said position measuring system comprises a counter.

23. The device in accordance with claim 18, wherein said position measuring system comprises a memory unit for storing an actually determined position data.

5 24. The device in accordance with claim 18, wherein said control unit comprises a processor.

25. The device in accordance with claim 18, wherein said control unit comprises a logic circuit.